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GRANULAR AMMONIUM NITRATE

A High-Analysis, Low-Cost, All-Purpose
Nitrogen Fertilizer

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U. S. DEPARTMENT OF AGRICULTURE



THE SUPPLY of fertilizer nitrogen available to the farmers of this country in the present season, 1943-44, will be some 35 percent greater than in any previous year.

There will therefore be more nitrogen in mixed fertilizers and for direct application as top- and side-dressings.

Efficiently used, this increased supply, equivalent to about 850,000 tons of ammonium sulfate, will greatly increase food, feed, and fiber production.

New forms of ammonium nitrate fertilizer, developed and made available in wartime, should appeal to the farmer for at least three reasons:

- (1) They will supply about 20 percent of our fertilizer nitrogen this season and are an important factor in making possible the 35-percent increase in the Nation's fertilizer nitrogen supply.
- (2) They offer a means of utilizing new synthetic nitrogen plants for fertilizer purposes after the war.
- (3) Ammonium nitrate is and may continue to be a low-cost source of nitrogen for direct application.

Because of the development of these new ammonium nitrate materials fertilizer nitrogen is one of the few things a farmer buys that may cost less in 1944 than before the war.

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Prepared by the

*Division of Soil and Fertilizer
Investigations*

*Bureau of Plant Industry, Soils, and
Agricultural Engineering*

*Agricultural Research Administration
U. S. Department of Agriculture*

Nitrate and Ammonia Nitrogen

Pure ammonium nitrate is a white crystalline compound very much like table salt in general appearance. It is made from nitric acid and ammonia, both of which are produced at synthetic nitrogen plants. The nitric acid appears in the compound as nitrate nitrogen and the ammonia as an equal quantity of ammonia nitrogen.

Putting both forms of nitrogen in one compound makes possible a higher analysis fertilizer, with consequent savings in bags, labor, freight, and other distribution costs. It also gives ammonium nitrate fertilizer properties similar to those of two of the best nitrogen fertilizers—sodium nitrate and ammonium sulfate.

An Excellent Source of Nitrogen

Ammonium nitrate has long been recognized as an excellent source of nitrogen for all crops and is much like two fertilizers combined in one. The new ammonium nitrate fertilizers contain as much nitrate nitrogen as sodium nitrate and almost as much ammonia nitrogen as ammonium sulfate. The fertilizing action and value under most conditions will be practically the same as that resulting from the use of an equivalent quantity of a 50-50 mixture of sodium nitrate and ammonium sulfate.

The Department of Agriculture and many State experiment stations have used ammonium nitrate in fertilizer experiments with corn, cotton, potatoes, tobacco, apples, and truck crops. The results show that it is just as good as the more common nitrogen fertilizers as an all-purpose source of nitrogen. For example, the Mississippi Agricultural Experiment Station recently reported very good results from ammonium nitrate for corn, cotton, and oats in both the delta and hill sections of the State. In Maryland, ammonium nitrate was slightly superior to most of the other sources of nitrogen used in a 10-year trial with tobacco. Very satisfactory results were obtained with ammonium nitrate for potatoes in Maine, on Long Island, N. Y., and in Pennsylvania, Virginia, and North Carolina, as well as for cotton

in North Carolina, South Carolina, Louisiana, and Arkansas.

Like all nitrate nitrogen, that in ammonium nitrate moves with the soil moisture and may be leached by heavy rains or may rise to the surface in dry weather. The ammonia nitrogen in the compound, however, is just as resistant to leaching and movement in the soil as that in ammonium sulfate. Ammonium nitrate is slightly acid forming in its action on the soil but develops only one-third as much acidity as an equivalent quantity of ammonium sulfate or phosphate.

Extensively Used in Fertilizers

For the last 15 years ammonium nitrate has been used extensively in mixed fertilizers. Approximately 65,000 tons were used in 1941, and more than 200,000 tons will go into mixed fertilizers in 1944. Granulated with limestone—as Cal-nitro—it has been used for direct application in this country, but more extensively in England, Denmark, Holland, and Germany. In all these countries it has been a very good nitrogen fertilizer, as demonstrated both by official experiments and by the results obtained on many farms.

New Sources and Forms

In 1944 farmers of the United States and Canada will have opportunity to use new and improved ammonium nitrate fertilizers that will be made at synthetic-nitrogen plants completed in both countries since the beginning of the second World War. One of the plants is that of the Tennessee Valley Authority, in Alabama. Others are in Arkansas, Kansas, and Ohio and in Canada. The material produced in the United States will be sold as "Ammonium Nitrate Fertilizer," while the Canadian product will be sold under the trade name "Nitraprills." These new fertilizers will be guaranteed to contain 32.5 percent nitrogen, as compared with 16 percent in sodium nitrate and 20.5 percent in ammonium sulfate.

Ammonium nitrate has two properties that

have tended to discourage its use as a fertilizer. It absorbs moisture from the air more readily than most fertilizer materials, and it tends to cake in storage. As a result of research conducted by the manufacturers and by fertilizer technologists of the Bureau of Plant Industry, Soils, and Agricultural Engineering, the new forms of ammonium nitrate are treated to partially overcome these undesirable properties.

Granulation of fertilizer materials reduces their tendency to cake and makes them easier to distribute in drills or by hand. After granulating to reduce caking, the granules are coated with a waxlike material and a fine claylike dust. The wax minimizes moisture absorption and in combination with the dusting agent further reduces caking in storage. These treatments—granulation, waxing, and dusting—improve the physical properties of the fertilizer.

The new types of granulated ammonium nitrate differ somewhat in the size of the granules (see illustration, page 7). The TVA product contains about 35 percent of plus 20-mesh granules, 50 percent of 20–40 mesh, and 15 percent of minus 40 mesh. The Canadian material has a higher percentage of large particles; 80 percent will not pass 20 mesh, and less than 5 percent is smaller than 40 mesh.

One plant in western Canada produces a well-conditioned crystalline material, and there is a small production of still another type of satisfactorily conditioned ammonium nitrate in California. These materials, for the most part, will be used on the West coast.

Storage and Handling

Ammonium nitrate is shipped in 100-pound moistureproof bags. This further insures its reaching the farm in good condition. It should, of course, be kept in the bags until used.

Like other fertilizers, ammonium nitrate should be stored in a dry barn or shed. If the floor tends to be damp, put it on a platform 6 to 12 inches above the floor. If it is to be stored for several

months, avoid piling more than 8 or 10 bags high. The higher it is piled the more likely that the bottom bags will cake. If caking does occur, it may be broken up by dropping the bags 3 or 4 times; but in cases of severe caking it may be necessary to empty the bag and break the lumps by tamping or by other suitable means.

Ammonium nitrate is an explosive, in that it can be made to explode by the use of a sufficiently strong detonator—another explosive. There is, however, no explosion hazard involved when it is handled like other fertilizer materials on the farm. The fire hazard is about the same as with sodium nitrate. The emptied bags, like those in which sodium nitrate has been shipped, should be burned—not allowed to accumulate around the barn, as they are quite inflammable. Burlap or cotton bags could, of course, be washed to remove the ammonium nitrate, and if this is done, repeated washing should be made to remove it completely from the fabric.

Distribution in the Field

Granular ammonium nitrate can be distributed by common types of fertilizer distributors or by hand. It can be handled in the same way that ammonium sulfate and sodium nitrate are ordinarily handled. The granular condition of the product makes distribution easy and largely prevents foliage injury, as the granules do not adhere to the leaves. Since even the improved product will gradually take up moisture on exposure to humid conditions, any unused material should be protected by folding and tying the bag in such manner as to keep the contents from the air.

Recommendations for Different Crops

Recommendations as to the fertilization of various crops with ammonium nitrate should be obtained from county agents, extension agronomists, or the State agricultural college.

In general, ammonium nitrate can be used in the same way and for the same purposes as

ammonium sulfate, sodium nitrate, and Cyanamid. It is important to remember that ammonium nitrate fertilizer contains twice as much nitrogen as sodium nitrate and 60 percent more than ammonium sulfate. Unless the rate of nitrogen fertilization is to be increased, use 50 pounds of ammonium nitrate instead of 100 of sodium nitrate, or 60 pounds instead of 100 of ammonium sulfate.

Low-Cost Nitrogen

The improved ammonium nitrate fertilizers are probably the lowest cost sources of fertilizer nitrogen on the market. To be sure, the price per ton is higher, but the wise farmer figures the cost of the nitrogen. To figure the cost of a unit of nitrogen, 20 pounds, divide the price per ton by the percentage of nitrogen guaranteed (32.5 percent). For example, if ammonium nitrate costs \$60 per ton,

$\$60 \div 32.5 = \1.85 per unit (20 pounds) of nitrogen,

the cost of nitrogen is thus $9\frac{1}{4}$ cents a pound.

The high analysis of ammonium nitrate makes for low cost, owing to savings in freight, bags, and labor.



UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF PLANT INDUSTRY, SOILS, AND
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